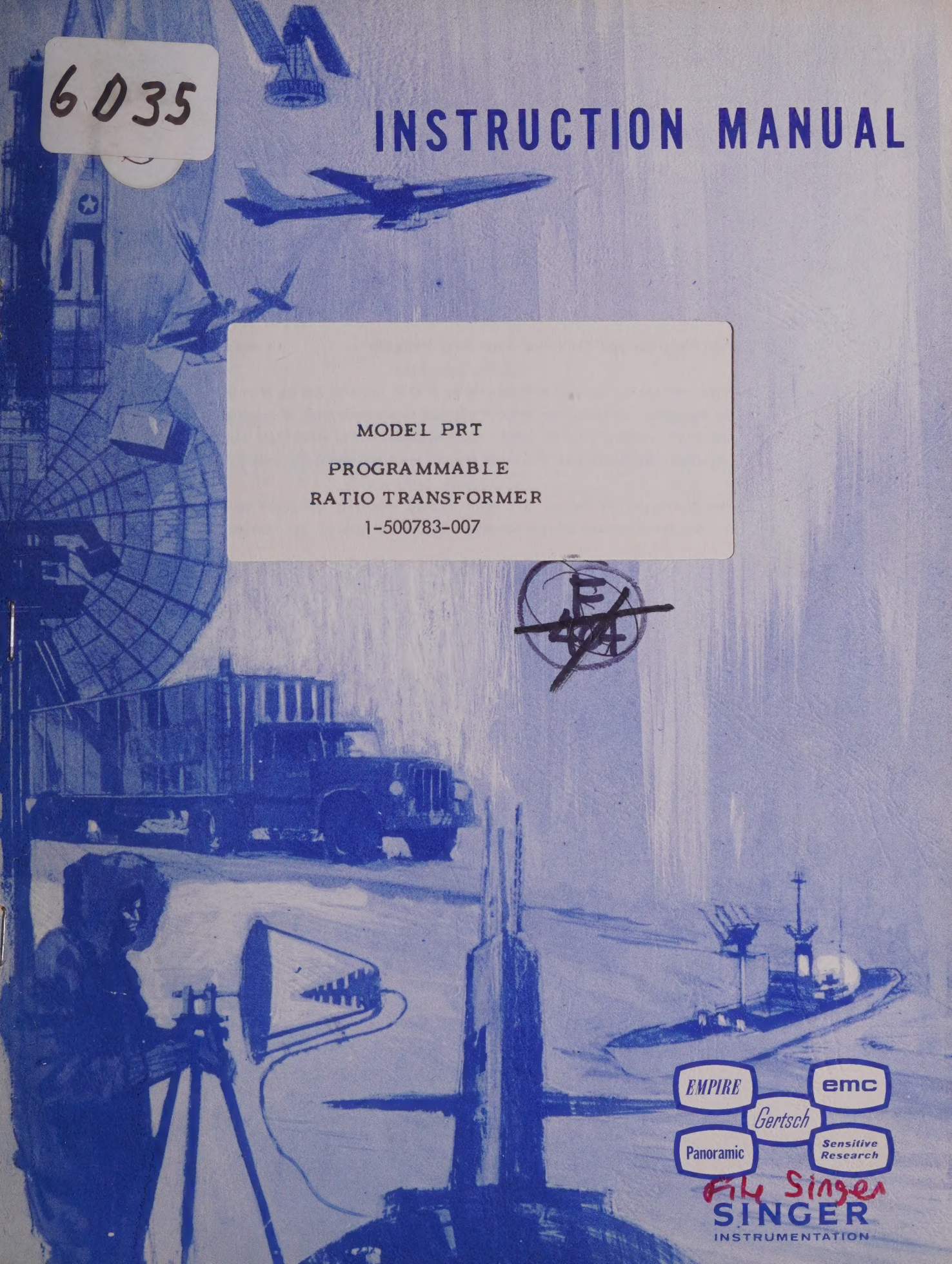
6035

INSTRUCTION MANUAL

MODEL PRT

PROGRAMMABLE
RATIO TRANSFORMER
1-500783-007



EMPIRE emc Gertsch Panoramic Sensitive Research

File Singer

SINGER
INSTRUMENTATION

INSTRUCTION MANUAL

WARD/DAVIS ASSOCIATES
757 E. Evelyn Ave.
Sunnyvale, Calif 94086
(408) 245-3700

MODEL PRT

PROGRAMMABLE
RATIO TRANSFORMER
1-500783-007

2/70

SINGER
INSTRUMENTATION

Precision electrical and electronic instruments for measurement

emc — EMPIRE* — Gertsch* — Panoramic* — Sensitive Research*

THE SINGER COMPANY • METRICS DIVISION

*A Trademark of THE SINGER COMPANY

WARRANTY

THE SINGER COMPANY, METRICS DIVISION, warrants each new instrument to be free from defects in material and workmanship, effective after delivery to the original purchaser as follows:

*Sensitive Research** Electrical indicating Instruments . . . . . 2 years
Other Electrical and Electronic Measuring Instruments . . . . . 1 year

Repair or replacement (at our option) without charge (F.O.B. factory) will be effected when our examination satisfactorily indicates that defects are due to workmanship or materials. Electron tubes, semiconductors, batteries, fuses, lamps, thermoelements, and *RatioTran** potentiometers are excluded from warranty coverage. Warranty returns must first be authorized by the factory.

If the instrument or any portion thereof, has been abused, misused, damaged by accident or negligence, or if any serial number or seal has been removed or altered, the warranty is void.

This warranty is in lieu of all other obligations or liabilities expressed or implied and The Singer Company neither assumes, nor authorizes any person to assume for them, any other liability in connection with sales of instruments manufactured by The Singer Company, Metrics Division.

THE SINGER COMPANY • METRICS DIVISION
915 PEMBROKE STREET, BRIDGEPORT, CONNECTICUT • 3211 S. LA CIENEGA BLVD., LOS ANGELES, CALIFORNIA

* A TRADEMARK OF THE SINGER COMPANY

REPAIR AND MAINTENANCE

Instruments should be returned only on prior written authorization from the Singer Representative or the factory(1) Warranty repair will be made upon written request. Please provide the following information in order to expedite our processing of your instrument:

1. Model or Type
2. Serial Number
3. Description of trouble(2)
4. Test instruments used
5. Approximate date instrument was placed in operation
6. Approximate number of hours of use
7. Has maintenance action been previously requested?
8. Other comments

Upon receipt of this information our Service Department will send you service data or shipping instructions. Upon receipt of shipping instructions forward the instrument to the factory prepaid. If requested, an estimate of charges will be made before work begins.

(1) Contact Metrics Division, Bridgeport, Connecticut for *Empire** *Panoramic**, and *Sensitive Research** instruments. Contact Metrics Division, Los Angeles, California for *Gertsch** instruments.
(2) Include data on symptoms, measurements taken, suspected location of trouble, maintenance action taken, and any other relevant data.

TABLE OF CONTENTS

Section		Page
I	GENERAL DESCRIPTION	1-1
II	INSTALLATION	2-1
III	OPERATION	3-1
IV	THEORY OF OPERATION	4-1
V	MAINTENANCE	5-1
VI	CALIBRATION	6-1
VII	PARTS LIST	7-1

LIST OF TABLES

Table		Page
1-1	Specifications	1-1
1-2	Models	1-2
2-1	Pin Connections, Decade Units	2-1
2-2	Pin Connections, Octal Units	2-2
3-1	Binary Ratio Table	3-3
6-1	List of Test Equipment	6-2

LIST OF ILLUSTRATIONS

Figure		Page
1-1	Model PRT Programmable Ratio Transformer	ii
2-1	Full Rack Mounting	2-3
2-2	Half Rack Mounting	2-3
2-3	Front Mounting	2-3
2-4	Side Mounting	2-3
3-1	Typical Test Setup	3-2
3-2	Typical Digital-To-Analog Application	3-2
4-1	Interconnection Diagram, Decade Units	4-2
4-2	Schematic Diagram, Decade Unit Terminal Board	4-2
4-3	Layout of Parts, Decade Unit Terminal Board	4-2
4-4	Interconnection Diagram, Octal Units	4-3
4-5	Schematic Diagram, Octal Unit Terminal Board	4-3
4-6	Layout of Parts, Octal Unit Terminal Board	4-3
4-7	Direct Input	4-4
4-8	Isolated Input	4-4
4-9	Interconnection Diagram, Phase Inversion	4-5
4-10	Schematic, TB7, Phase Inversion	4-5
4-11	Layout of Parts, Terminal Board TB7	4-5
4-12	Interconnection Diagram, Phase Inversion and Voltage Selection	4-6
4-13	Schematic Diagram, Latching Means	4-7
6-1	Impedance Test Setup	6-2
6-2	Ratio Accuracy Test	6-2
7-1	Layout of Parts	7-1

TABLE 1-2. MODELS

P RT A B C

PROGRAMMABLE

RATIOTRAN

CODING
- O Straight Binary Code (Octals)
- D BCD (Decades)

RESOLUTION
- 3 Octal (2^9)
- 3 Decade (.1%)
- 4 Octal (2^{12})
- 4 Decade (.01%)
- 5 Octal (2^{15})
- 5 Decade (.001%)
- 6 Octal (2^{18})
- 6 Decade (.0001%)

RELAY COMMON VOLTAGE
- 0 +28 vdc
- 1 -28 vdc

D E O

LATCHING

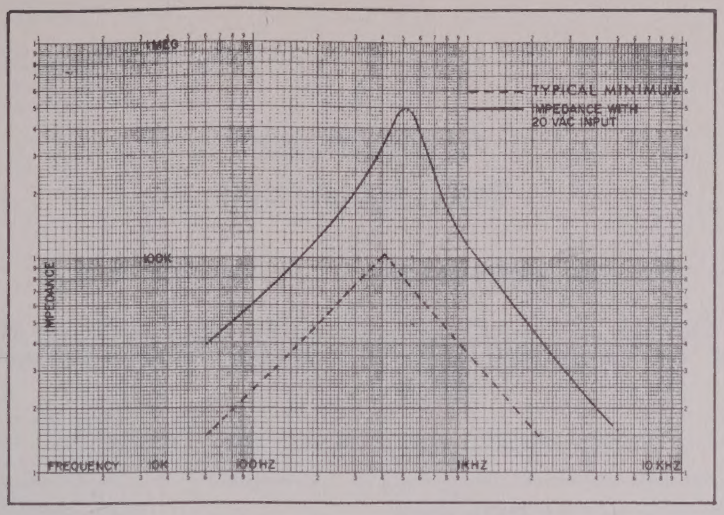
0 Latching	No Indicator Connections	No Delatch Relay
1 Latching	No Indicator Connections	Delatch Relay
2 Latching	Indicator Connections	Delatch Relay
3 No Latching	No Indicator Connections	No Delatch Relay
4 No Latching	Indicator Connections	No Delatch Relay

SPECIAL FEATURES

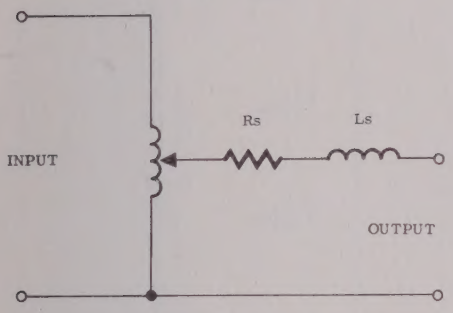
0 Direct Input	No Phase Inversion	No Voltage Selection
1 Isolated Input	No Phase Inversion	No Voltage Selection
2 Isolated Input	Phase Inversion	No Voltage Selection
3 Isolated Input	Phase Inversion	Voltage Selection (100:100, 100:10)
4 Isolated Input	Phase Inversion	Voltage Selection (115:115, 115:28)
5 Isolated Input	Phase Inversion	Voltage Selection (115:115, 115:100)

MOUNTING
- 0 Full Rack (See figure 2-1)
- 1 Half Rack (See figure 2-2)
- 2 Front (See figure 2-3)
- 3 Side (See figure 2-4)

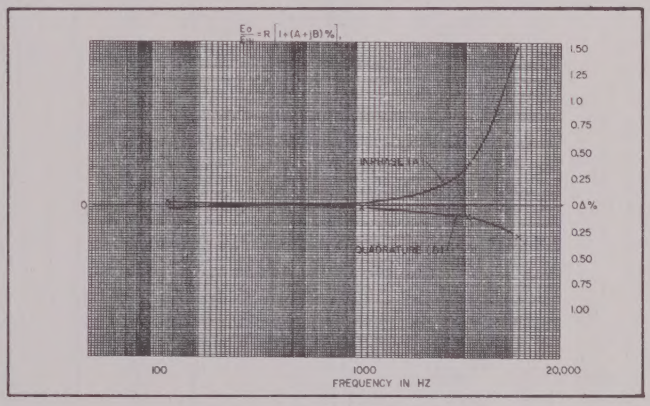
EXAMPLE: PRT-D-30212 is a programmable RatioTran with 3 decades, a +28vdc RELAY COMMON voltage, contacts which may serve a dual latching and external indication function, an isolated input, and front mtg.



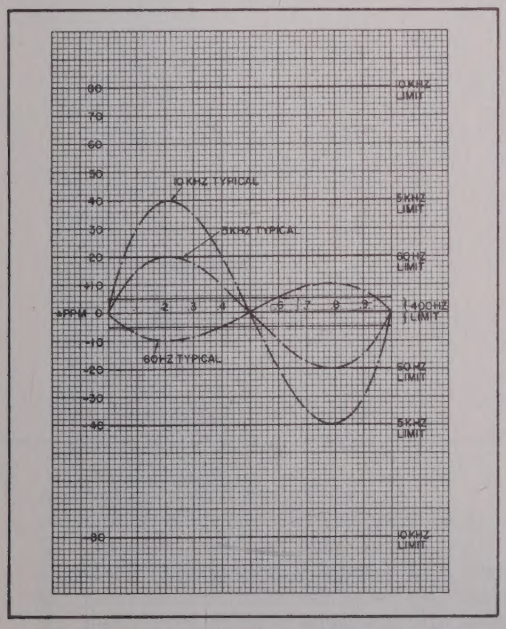
Input Impedance, Direct Mode



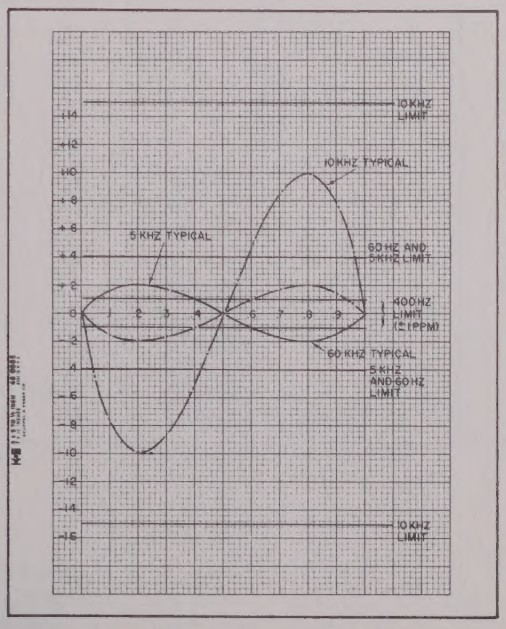
Equivalent Circuit



Error, Isolated Units



Inphase Ratio Error, PPM of Input
(Direct Units)



Quadrature Ratio Error PPM of Input
(Direct Units)

SECTION II
INSTALLATION

2-1. UNPACKING.

2-2. No special handling or unpacking procedures are required. After unpacking, inspect unit for any evidence of damage.

2-3. MOUNTING.

2-4. The unit is designed to be mounted with four screws (see figure 2-1). No other mounting is required.

TABLE 2-1. PIN CONNECTIONS, DECADE UNITS

SIGNAL CONNECTOR (J1) MRE-34P-J6

PIN	CONNECTION	NOTES
A, B, C, D	8, 4, 2, 1 — $X10^{-1}$	
E, F, H, J	8, 4, 2, 1 — $X10^{-2}$	
K, L, M, N	8, 4, 2, 1 — $X10^{-3}$	
P, R, S, T	8, 4, 2, 1 — $X10^{-4}$	A
U, V, W, X	8, 4, 2, 1 — $X10^{-5}$	B
Y, Z, AA, BB	8, 4, 2, 1 — $X10^{-6}$	C
CC	PHASE (180°)	D
DD	VOLTAGE	E
EE	UN-LATCH	F
FF	LATCH COMMON	
HH	INPUT HI	
JJ	INPUT LO	
KK	OUTPUT HI	
LL	OUTPUT LO	
MM	CASE GRD	
NN	RELAY COMMON	

INDICATOR-LATCH CONNECTOR (J2) MRE-34S-J6 (NOTE G)

PIN	CONNECTION	NOTES
A, B, C, D	8, 4, 2, 1 — $X10^{-1}$	
E, F, H, J	8, 4, 2, 1 — $X10^{-2}$	
K, L, M, N	8, 4, 2, 1 — $X10^{-3}$	
P, R, S, T	8, 4, 2, 1 — $X10^{-4}$	A
U, V, W, X	8, 4, 2, 1 — $X10^{-5}$	B
Y, Z, AA, BB	8, 4, 2, 1 — $X10^{-6}$	C
CC	180°	D
DD	V2	E
EE	0°	D
FF	V1	E
HH	SPARE	
JJ	SPARE	
KK	SPARE	
LL	SPARE	
MM	SPARE	
NN	LATCH COMMON	

NOTES:

A. Not used on 3 decade units.
B. Not used on 4 (or less) decade units.
C. Not used on 5 (or less) decade units.
D. Used only on units equipped with phase inversion.
E. Used only on units equipped with voltage selection.
F. Used only on units equipped with delatch relay.
G. May be omitted.

2-5. ELECTRICAL CONNECTIONS.

2-6. Refer to table 2-1 for the pin connections as a decade unit (1, 2, 4, 8, BCD PROGRAM) or to table 2-2 for an octal unit (1, 2, 4, STRAIGHT binary program). Mating connector for J1 is Winchester Part No. MRE-34S-J6. Mating connector for J2 is Winchester Part No. MRE-34P-J6.

2-7. INSTALLATION CHECKOUT.

2-8. Refer to section VI for an installation checkout procedure.

TABLE 2-2. PIN CONNECTIONS, OCTAL UNITS

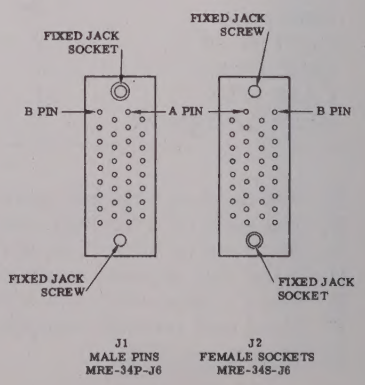
SIGNAL CONNECTOR (J1) MRE-34P-J6

PIN	CONNECTION	NOTES
B	Bit 1 (.500)	
C	Bit 2 (.250) 1st Octal	
D	Bit 3 (.125)	
F	Bit 4 (.0625)	
H	Bit 5 (.031250) 2nd Octal	
J	Bit 6 (.015625)	
K	Bit 7 (.0078125)	
M	Bit 8 (.00390625) 3rd Octal	
N	Bit 9 (.00195312)	
R	Bit 10 (.00097656)	
S	Bit 11 (.00048828) 4th Octal	A
T	Bit 12 (.00024414)	
V	Bit 13 (.00012207)	
W	Bit 14 (.00006104) 5th Octal	B
X	Bit 15 (.00003052)	
Z	Bit 16 (.00001526)	
AA	Bit 17 (.00000763) 6th Octal	C
BB	Bit 18 (.00000381)	
CC	PHASE (180°)	D
DD	VOLTAGE	E
EE	UN-LATCH	F
FF	LATCH COMMON	
HH	INPUT HI	
JJ	INPUT LO	
KK	OUTPUT HI	
LL	OUTPUT LO	
MM	CASE GRD	
NN	RELAY COMMON	

INDICATOR-LATCH CONNECTOR (J2) MRE-34S-S6 (NOTE G)

PIN	CONNECTION	NOTES
B	Bit 1	
C	Bit 2	
D	Bit 3	
F	Bit 4	
H	Bit 5	
J	Bit 6	
L	Bit 7	
M	Bit 8	
N	Bit 9	
R	Bit 10	
S	Bit 11	
T	Bit 12	
V	Bit 13	
W	Bit 14	
X	Bit 15	
Z	Bit 16	
AA	Bit 17	
BB	Bit 18	
CC	180°	D
DD	V2	E
EE	0°	D
FF	V1	E
HH	SPARE	
JJ	SPARE	
KK	SPARE	
LL	SPARE	
MM	SPARE	
NN	LATCH COMMON	

NOTES:
- A. Not used on 3 octal units.
- B. Not used on 4 (or less) octal units.
- C. Not used on 5 (or less) octal units.
- D. Used only on units equipped with phase inversion.
- E. Used only on units equipped with voltage selection.
- F. Used only on units equipped with delatch relay.
- G. May be omitted.



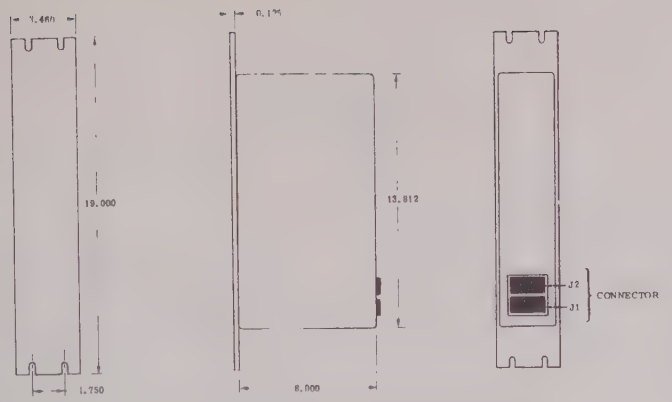


Figure 2-1. Full Rack Mounting

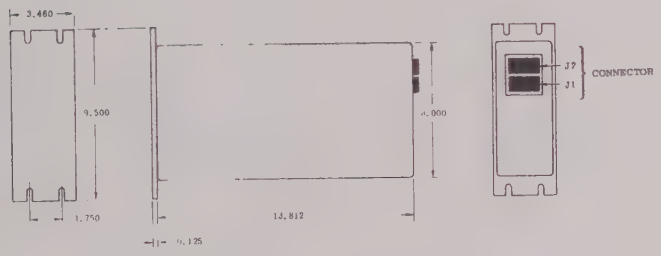


Figure 2-2. Half Rack Mounting

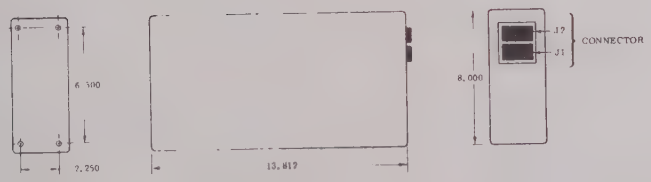


Figure 2-3. Front Mounting

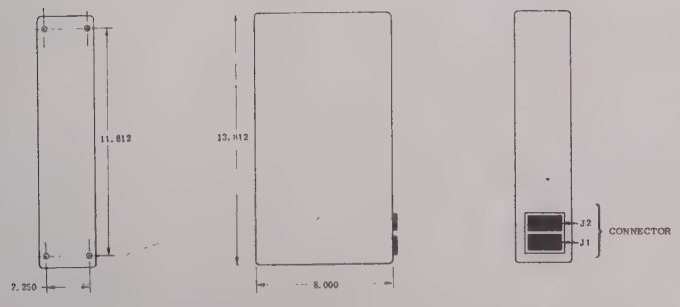


Figure 2-4. Side Mounting

SECTION III
OPERATION

3-1. GENERAL.

3-2. A typical test setup for measuring the output signals of a unit under test is shown in figure 3-1. In this application, a Gertsch Model PAV phase angle voltmeter, equipped with a meter relay, is used as a null indicator. When the two outputs are equal, the Model PAV indicates a null and the "GO" indicator is lit. If the output voltage of the unit under test varies from the output voltage ratio of the ratio transformer, the Model PAV detects an error voltage. When the error voltage exceeds a preset amount, the "NO GO" indicator is lit. A null indicator, such as a Gertsch Model NI-2, NI-3, or NI-4, may also be used for this application but without the "GO" - "NO GO" capability.

3-3. A typical digital-to-analog application is shown in figure 3-2. In this application, the RatioTran receives a parallel bit code input from the digital system. The PRT converts the system reference voltage input to a ratio voltage output. This output voltage is used to position the servo system.

3-4. Additional applications are included in the Engineering Bulletins which are appended to this instruction book.

3-5. CAUTION NOTES.

1. Make certain the input voltage does not exceed the voltage rating of the unit: 0.35 times the frequency (in HZ) or 350 vrms, whichever is less.

2. Make certain the input voltage does not contain a dc component. DC currents of more than a few microamperes will cause saturation of the input winding. If dc voltage is accidentally applied to the unit, degauss the input winding as outlined in the maintenance section.

3. Do not apply voltage across the output terminals. The voltage may be stepped up to an amount that exceeds the voltage rating of the unit.

3-6. OPERATION.

3-7. To operate the unit, proceed as follows:

a. Turn input voltage source on.

b. Turn command line voltage source on. Until a closure (ground) is furnished on one of the command lines, the output of the unit is zero.

c. Apply closures to the command lines associated with a required output ratio.

3-8. SPECIAL NOTES.

3-9. DECADE UNITS. If any decade receives an impossible command (any bit sum greater than 10), a nonsense ratio appears on the output. The nonsense ratio is 8 less than the programmed command.

Example: 8+4+2+1=15 command. 15-8=7, the output ratio.

3-10. OCTAL UNITS. To determine the bit lines associated with a required ratio, proceed as follows:

a. Select the 1, 2, 3 bit ratio closest to, but less than, the required ratio (see Table 3-1).

b. Subtract the 1, 2, 3 bit ratio from the required ratio.

c. Set the 4, 5, 6 bit ratio closest to, but less than, the difference ratio of step b.

d. Proceed with steps b and c for the 7, 8, 9, the 10, 11, 12, the 13, 14, 15, the 16, 17, 18 octals.

EXAMPLE:

1. 0.3457 is the desired ratio.
2. 0.250 is the 1, 2, 3 bit ratio closest to the required ratio therefore energize pin C.
3. 0.3457 - 0.250 = 0.0957.
4. 0.09375 is the 4, 5, 6 bit ratio closest to the difference therefore energize pins F and H.
5. 0.0957 - 0.09375 = 0.00195.
6. 0.000000 is the 7, 8, 9 bit ratio closest to the difference therefore none of the 7, 8, 9 bit pins should be energized.
7. 0.00170898 is the 10, 11, 12 bit closest to 0.00195 therefore energize pins R, S, and T.
8. 0.00195 - 0.00170898 = 0.00024102.
9. 0.00021363 is the 13, 14, 15 bit closest to 0.00024102 therefore energize pins V, W, and X.
10. 0.00024102 - 0.00021363 = 0.00002739.
11. 0.00002670 is the 16, 17, 18 bit closest to 0.00002739 therefore energize pins Z, AA, and BB.
12. 0.00002739 - 0.00002670 0.00000069.
13. With pins C, F, H, R, S, T, V, W, X, Z, AA, and BB energized, the output ratio of the unit is 0.34569931.

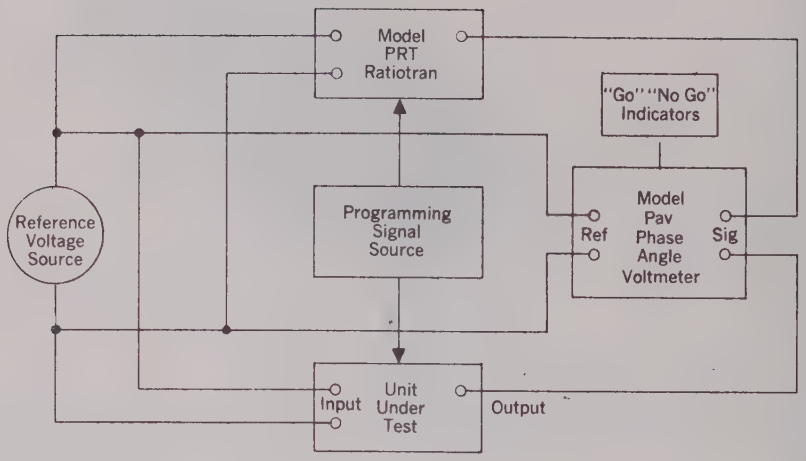


Figure 3-1. Typical Test Setup

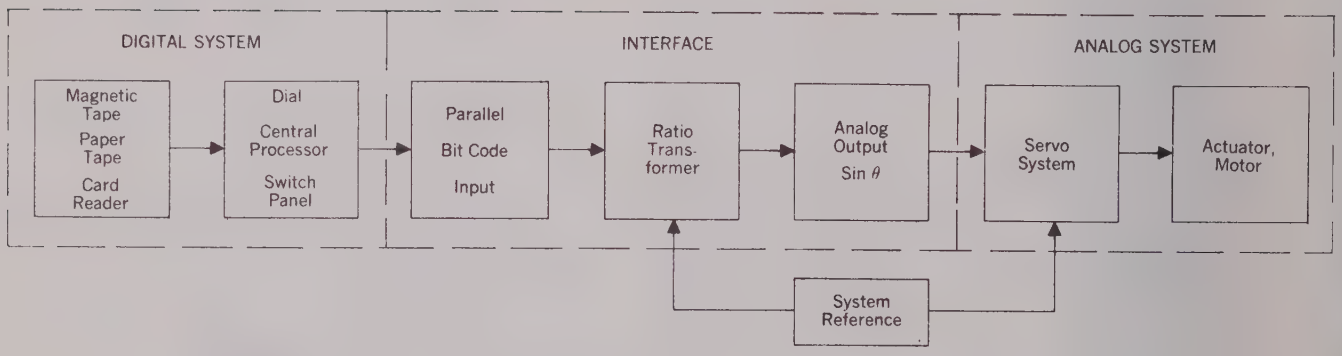


Figure 3-2. Typical Digital-To-Analog Application

TABLE 3-1. BINARY RATIO TABLE

OCTAL SETTING	1 2 3	4 5 6	7 8 9	10 11 12	13 14 15	16 17 18
	B C F	F H J	L M N	R S T	V W X	Z AA BB
.111	.875	.109375	.01367187	.00170898	.00021363	.00002670
.110	.750	.093750	.01171875	.00146484	.00018311	.00002289
.101	.625	.078125	.00976562	.00122070	.00015259	.00001907
.100	.500	.062500	.00781250	.00097656	.00012207	.00001526
.011	.375	.046875	.00585937	.00073242	.00009156	.00001144
.010	.250	.031250	.00390625	.00048828	.00006104	.00000763
.001	.125	.015625	.00195312	.00024414	.00003052	.00000381
.000	.000	.000000	.00000000	.00000000	.00000000	.00000000

NOTES:

1. The table is arranged by octals.
2. The numbers in the OCTAL SETTING column indicate the condition of the bit relays for the applicable octal.

   1 = energized or on
   0 = de-energized or off

3. The output ratio is the sum of all octal ratios.

3-11. LATCHING. The following functions apply to ratio selection, phaser inversion, and voltage selection:

a. No latching, no delatch relay. For these units, a continuous closure must be supplied to the bit lines. The relays open when the closure is broken.

b. Latching, no delatch relay. For these units, the bit relays may be programmed with a momentary closure. To delatch the relays, open the bit lines and the latching source.

c. Latching, delatch relay. For these units, the bit relays may be programmed with a momentary closure. To delatch the relays, supply a closure to pin EE.

3-12. PHASE INVERSION. If the unit is equipped with phase inversion, the output is in phase until a closure is supplied to pin CC. The output is inverted (180°) when a closure is supplied to pin CC.

3-13. VOLTAGE SELECTION. If the unit is equipped with voltage selection, the output is the first voltage (E1) until a closure is supplied to pin DD. The voltage is changed to (E2) when a closure is supplied to pin DD.

3-14. INDICATOR CONNECTIONS. The indicator connector J2 provides for a remote readout of the unit settings. The unit supplies the programming voltage for a bit indicator light or readout as shown in figure 4-13.

SECTION IV
THEORY OF OPERATION

4-1. GENERAL.

4-2. The RatioTran consists of a transformer winding for each decade or octal and control relays. Each winding provides precise portions of the input voltage. The portions are selected by the relays and added together to form the output voltage.

4-3. The windings are interconnected so that all windings are effectively on one core. The voltage on each section of a winding is equal to the voltage on any other section of the same winding. The voltage on a section of a winding is one-tenth the voltage on a section of the preceeding winding.

4-5. DECADE UNITS. (See figures 4-1, 4-2, and 4-3.)

4-6. BCD programming is used and four numbered bit lines per decade are provided. The numbers of the selected tap is the sum of the numbers for the energized bit lines. For example, tap 7 is selected when the No. 1, No. 2, and No. 4 bit lines are energized.

4-7. OCTAL UNITS. (See figures 4-4, 4-5, and 4-6.)

4-8. Straight binary programming is used and three numbered bit lines per octal are provided. As with the decade units, the number of the selected tap is the sum of the numbers for the energized bit lines.

4-9. SPECIAL FEATURES.

4-10. The various input circuits are shown in figures 4-7 through 4-12.

a. Figure 4-7 shows a direct input. The input voltage is placed directly across the first octal or decade winding.

b. Figure 4-8 shows an isolated input without phase reversal. The secondary of the isolation transformer functions as the first octal or decade winding.

c. Figure 4-9 shows an isolated input with phase reversal. The phase reversal relay, shown in figure 4-10, inverts the input voltage when energized.

d. Figure 4-12 shows an isolated input with phase reversal and voltage stepdown. The phase reversal relay, shown in figure 4-10, inverts the input voltage when energized. The voltage selection relay selects 9 stepdown voltage when energized. All programmed voltages then relate to the stepdown voltage instead of the input voltage.

4-11. LATCHING. (See figure 4-13.)

4-12. The various latching configurations and interconnections are shown in figure 4-13.

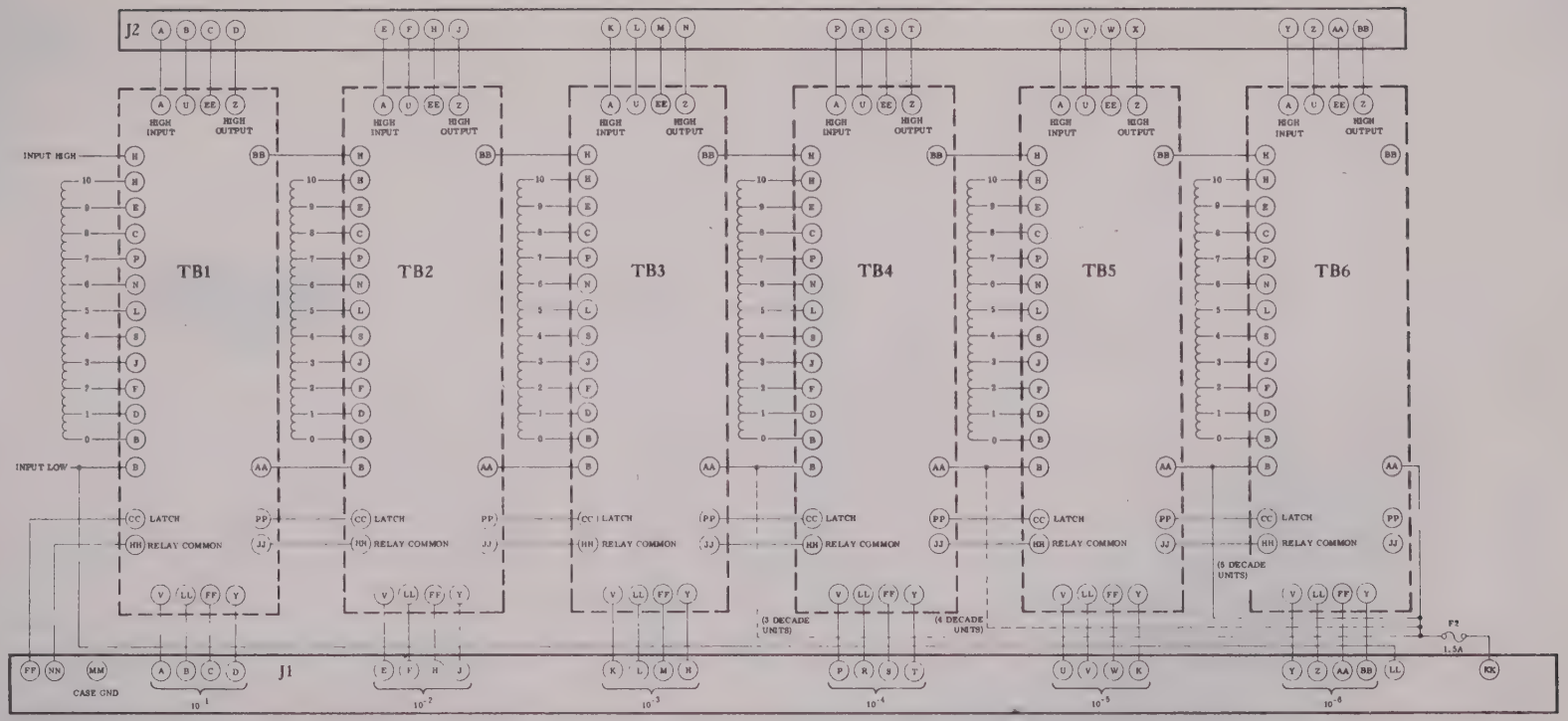


Figure 4-1. Interconnection Diagram, Decade Units

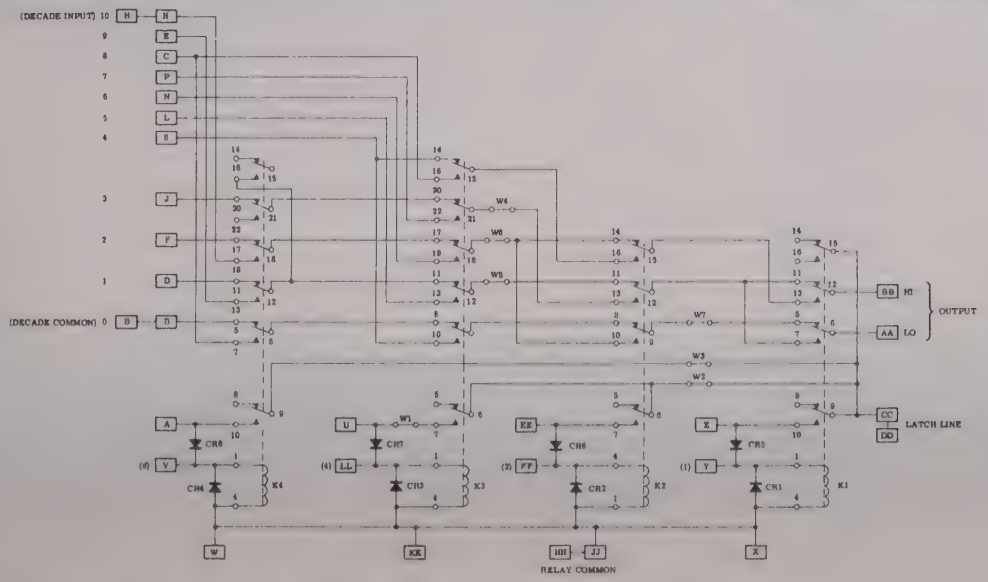


Figure 4-2. Schematic Diagram, Decade Unit Terminal Board

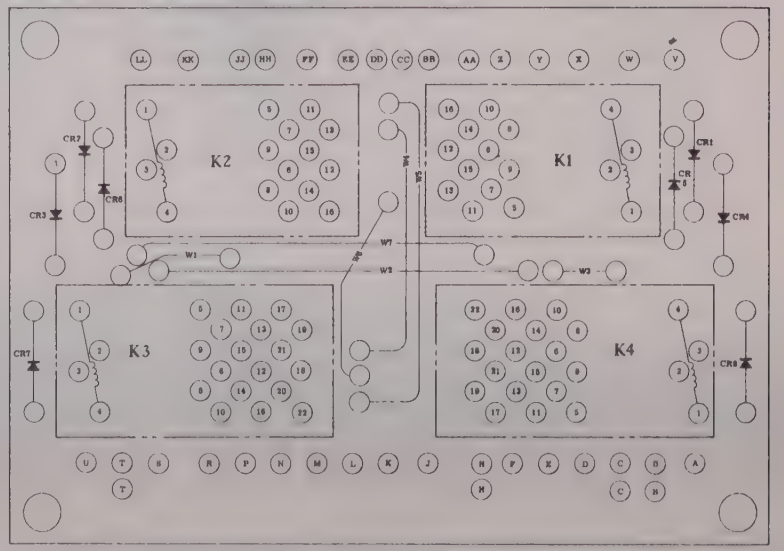


Figure 4-3. Layout of Parts, Decade Unit Terminal Board

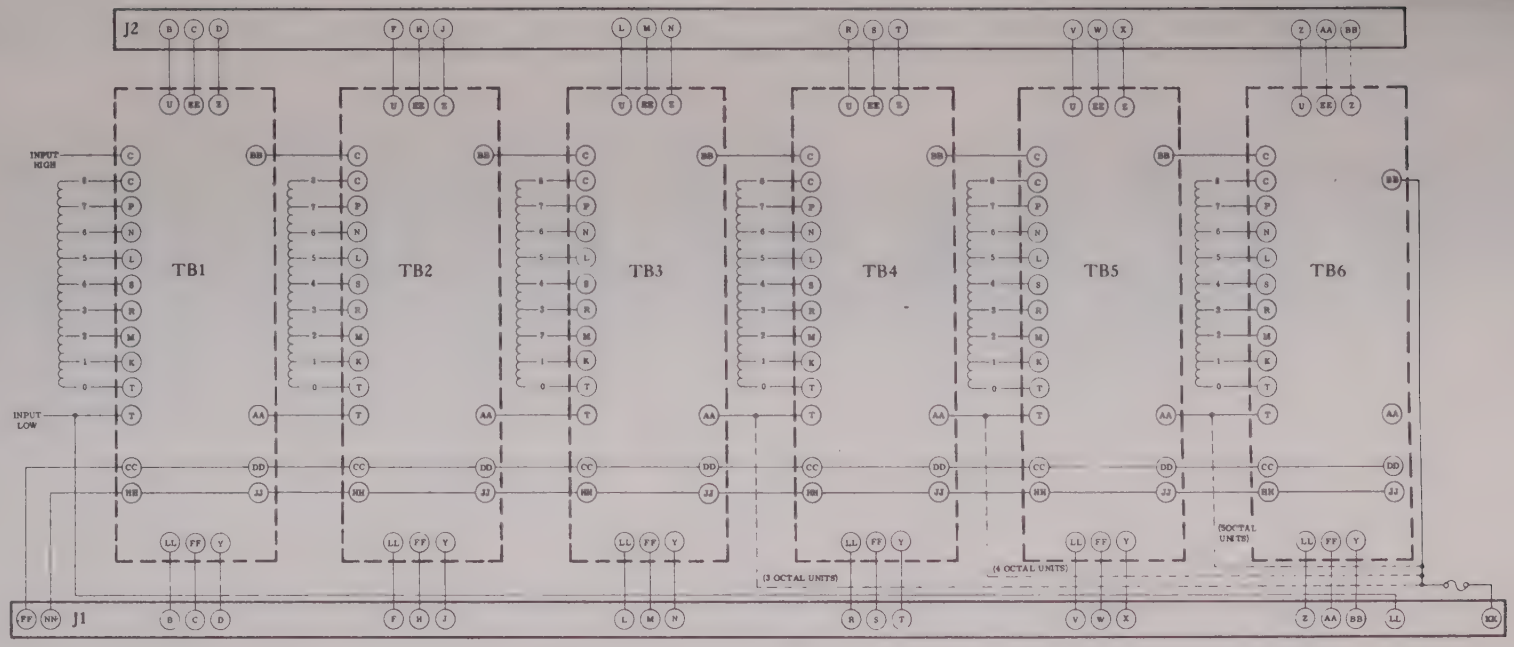


Figure 4-4. Interconnection Diagram, Octal Units

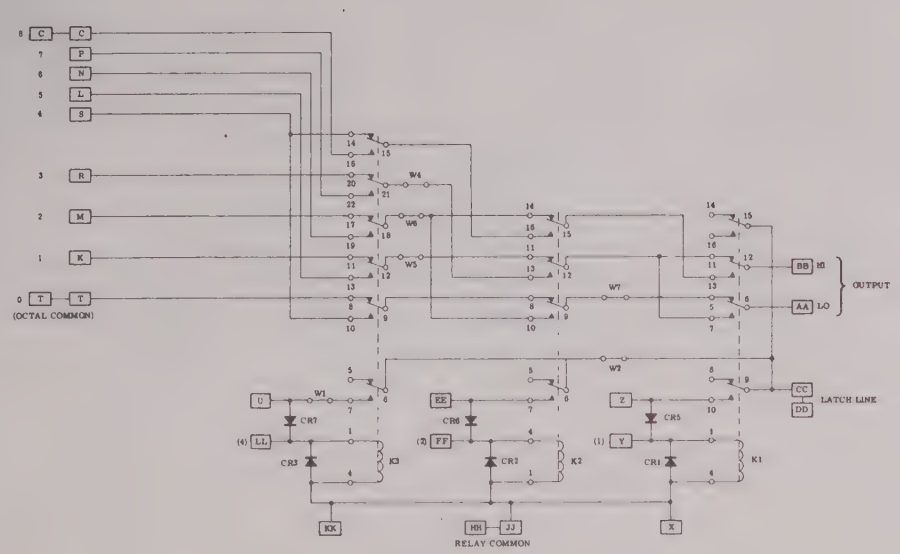


Figure 4-5. Schematic Diagram, Octal Unit Terminal Board

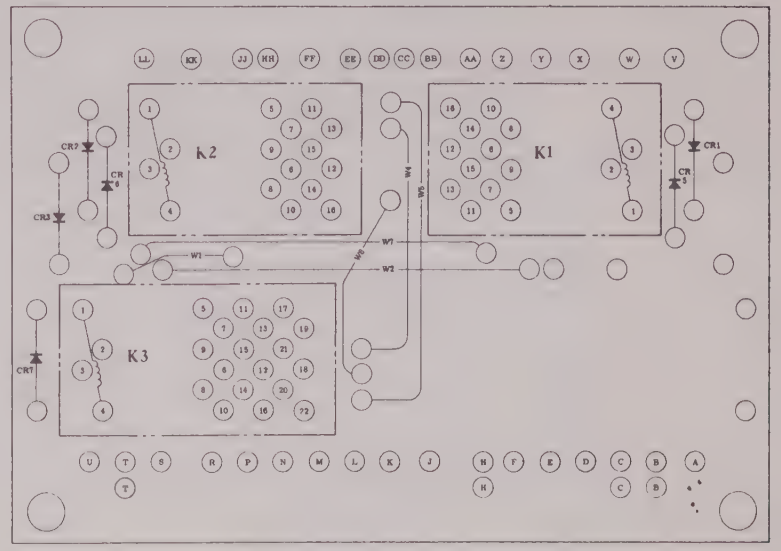


Figure 4-6. Layout of Parts, Octal Unit Terminal Board

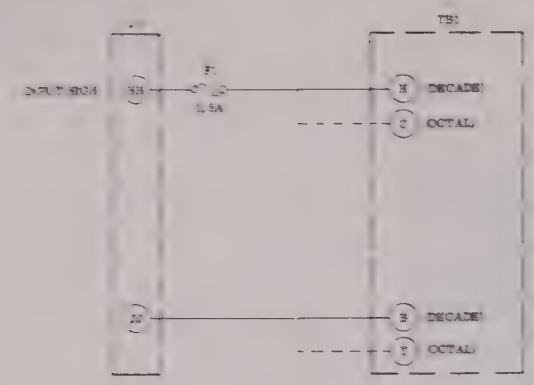


Figure 4-7. Direct Input

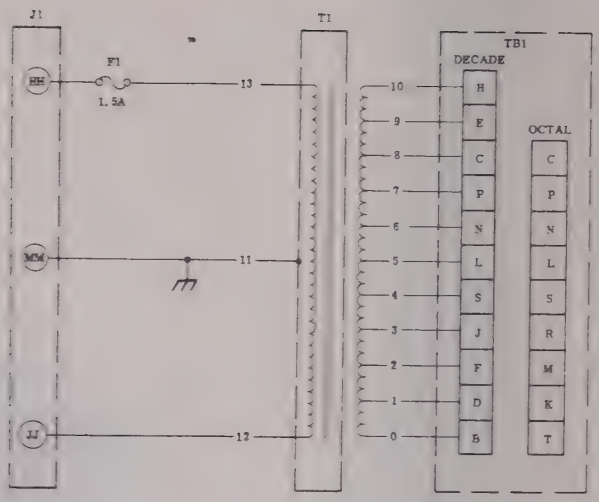


Figure 4-8. Isolated Input

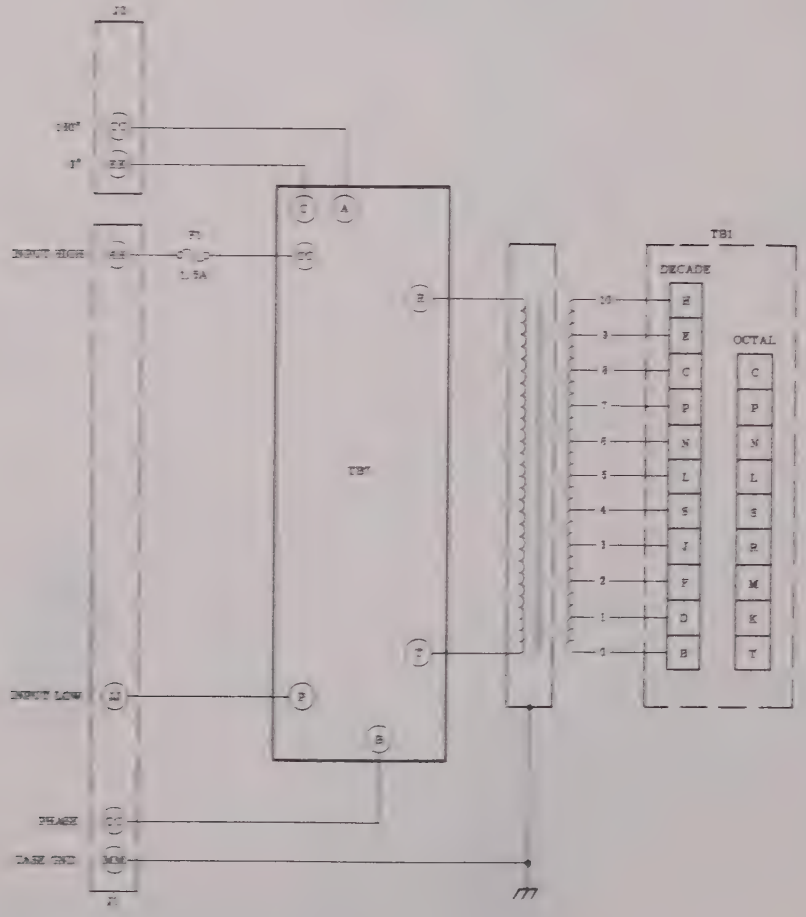


Figure 4-9. Interconnection Diagram, Phase Inversion

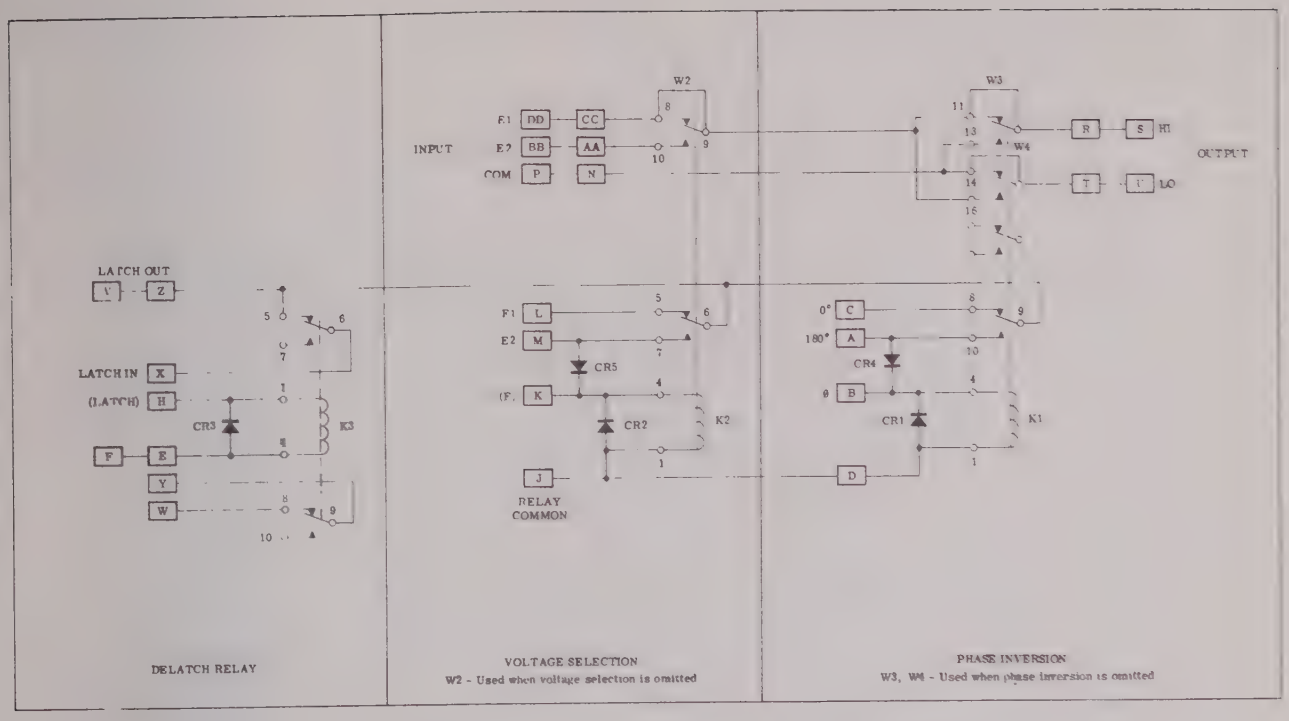


Figure 4-10. Schematic Diagram, Terminal Board TB7

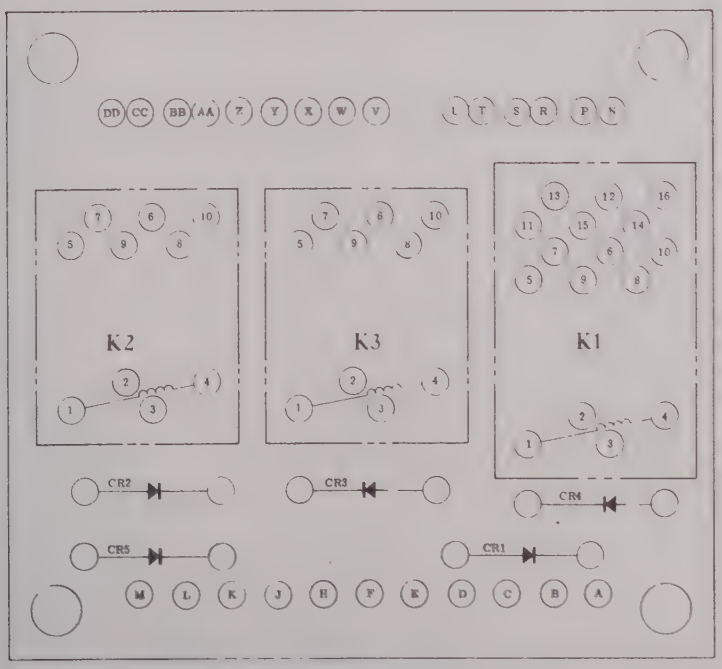


Figure 4-11. Layout of Parts, Terminal Board TB7

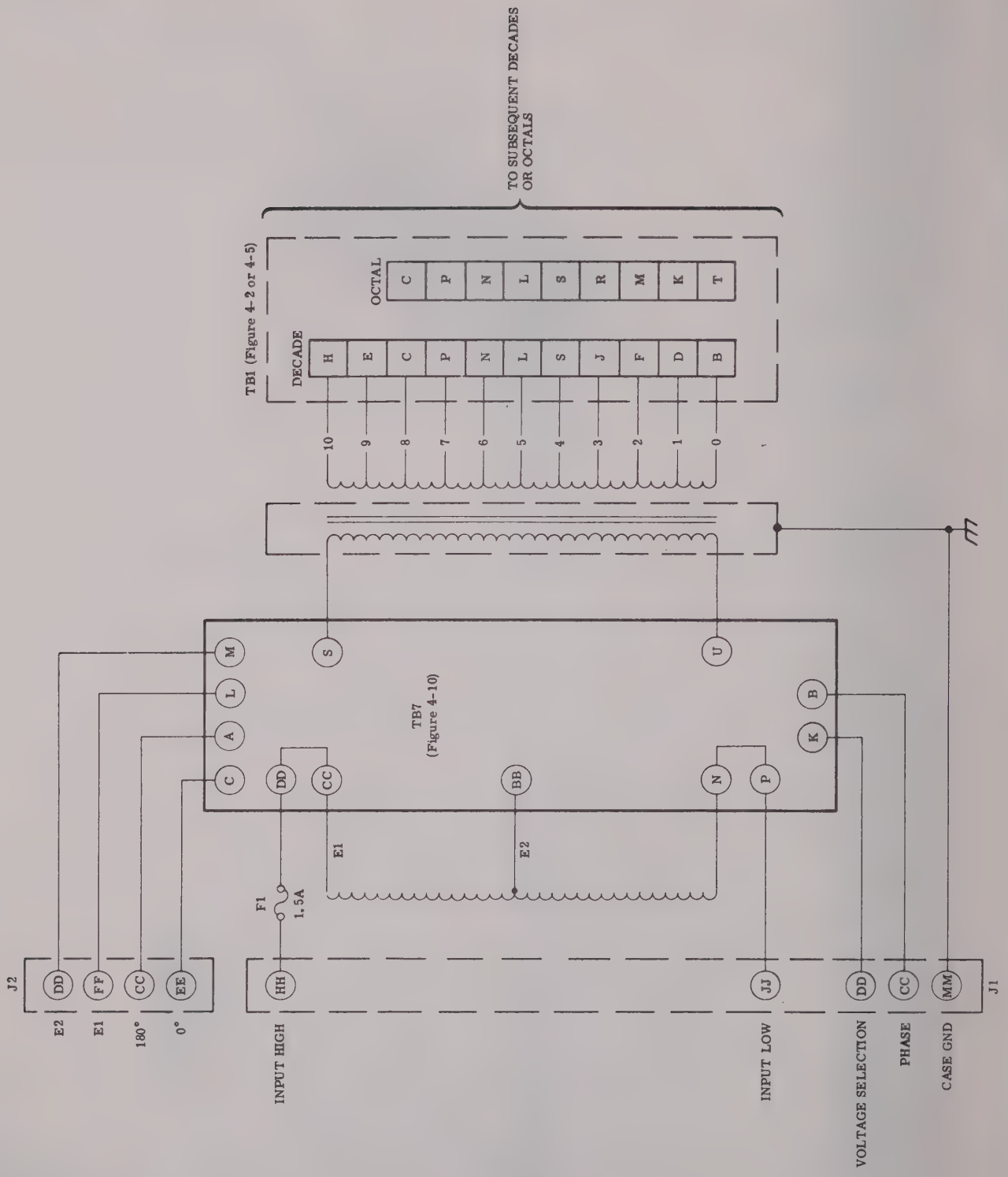

TO SUBSEQUENT DECADES OR OCTALS
TB1 (Figure 4-2 or 4-5)
OCTAL
C P N L S R M K T
DECADE
H E C P N L S J F D B
10 9 8 7 6 5 4 3 2 1 0
TB7 (Figure 4-10)
M L A C S U B K N P DD CC BB
E1
E2
F1 1.5A
J2
DD FF CC EE
E2 E1 180° 0°
HH JJ DD CC MM
J1
INPUT HIGH
INPUT LOW
VOLTAGE SELECTION
PHASE
CASE GND

Figure 4-12. Schematic Diagram, Phase Inversion and Voltage Selection

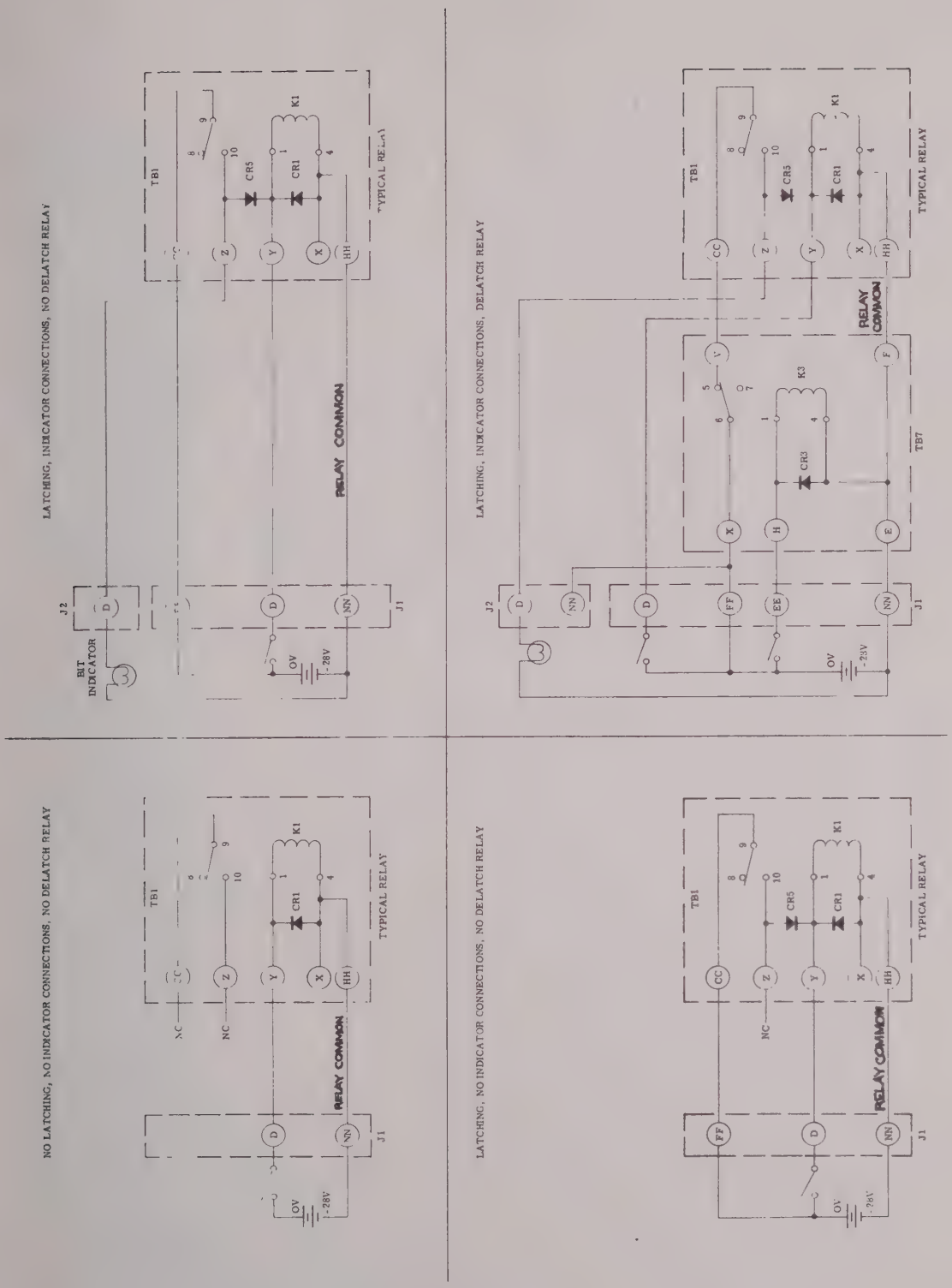


Figure 4-13. Latching Variations

SECTION V
MAINTENANCE

5-1. GENERAL.

5-2. Since the RatioTrans are passive devices, a minimum of maintenance is required. No maintenance on a regularly scheduled basis is required.

5-3. DEGAUSSING.

5-4. To degauss the unit, proceed as follows:

a. Connect a 1K resistor in series with the input connection.

b. By means of a variac or other suitable voltage control, apply a 60 HZ signal between the open end of the 1K resistor and the common terminal.

c. Starting with the voltage control at zero, increase voltage to 40 vrms.

d. Slowly decrease the voltage to zero. The period of time to reduce the voltage from 40 vrms to zero should be between 10 and 15 seconds.

5-5. REPAIRS.

5-6. If any repairs are made on the unit or if any parts are replaced, check accuracy as outlined in Section VI. If any transformer problems are encountered, it is recommended that the unit be returned to the factory for overhaul and recalibration.

5-7. DISASSEMBLY AND REASSEMBLY.

5-8. To gain access to parts, remove the top cover which is attached with six screws. No special sequence is required for further disassembly.

5-9. TROUBLE SHOOTING.

5-10. To isolate troubles, perform calibration procedure as outlined in Section VI. Refer to the schematic diagrams to determine the parts associated with a specific ratio.

SECTION VI
CALIBRATION

6-1. GENERAL.

6-2. The accuracy of the unit is dependent primarily on relay contact life of 1 million operations. A calibration check every 100,000 operations or every three years (whichever comes first) is recommended.

6-3. If the unit is used to measure six ratios per minute for six hours per day, the unit will operate 2,160 times per day. Under these conditions, a calibration check every 50 working days is recommended.

6-4. The calibration procedure consists of two tests: an input impedance test and a ratio accuracy test. Refer to Table 6-1 for a list of test equipment required. For a field test of the unit, any ratio transformer may be substituted for the Model 1011 AC Ratio Standard.

6-5. IMPEDANCE CHECK.

6-6. To check input impedance proceed as follows:

a. Connect unit into test setup as shown in figure 6-1.

b. Set input frequency to 400 HZ.

c. Adjust voltage source until VTVM V1 indicates 40 vrms (or more).

d. Adjust decade resistance box until VTVM V2 shows equal indications with switch SW-1 in either position A or B.

e. Read input impedance from the decade resistance box. The input impedance shall be 150K or more.

6-7. RATIO ACCURACY TEST.

6-8. To test the ratio accuracy proceed as follows:

a. Connect unit into test setup as shown in figure 6-2.

b. Set input frequency to 400 HZ.

c. Apply input voltage of 115 vac as indicated on VTVM V1.

d. Set RT standard controls for an output reading of 0.000000.

e. Adjust RatioTran control relays until the null indicator indicates a null.

f. Check the ratio indicated by the unit under test against the ratio indicated by the RT standard unit. The two ratios shall agree within ± 2 ppm.

g. For the decade units, repeat steps e through g for each switch position of the RT standard unit (0.11111, 0.22222, etc.).

h. For the octal units, refer to Table 3-1 for the binary ratios.

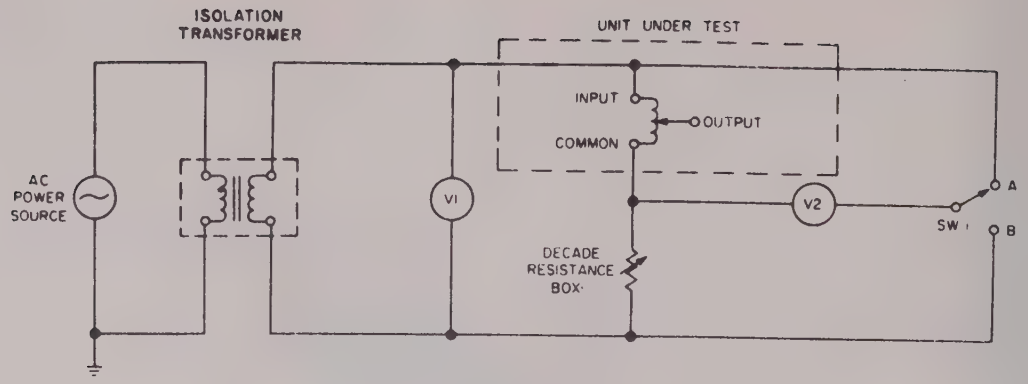


Figure 6-1. Impedance Test Setup

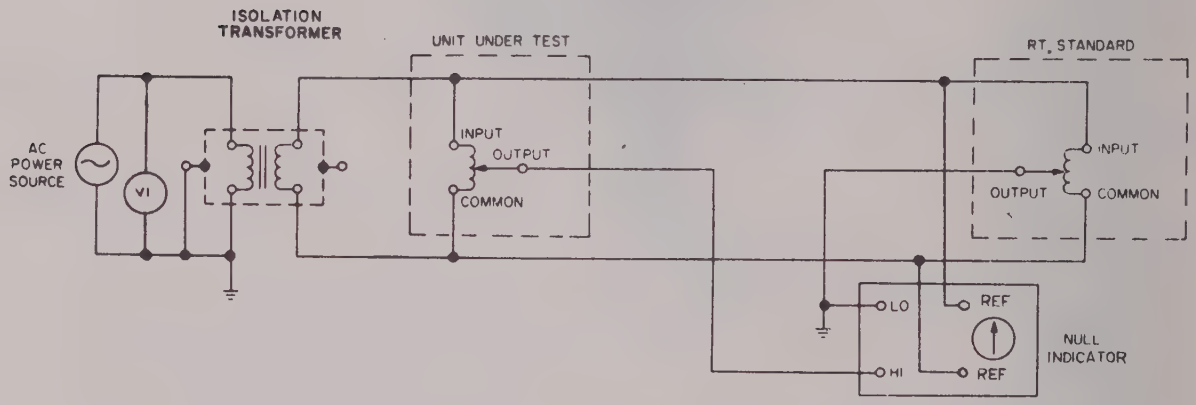


Figure 6-2. Ratio Accuracy Test

TABLE 6-1. LIST OF TEST EQUIPMENT

NOMENCLATURE	PART NUMBER OR MODEL	APPLICATION	RANGE	ACCURACY
AC Ratio Standard	Model 1011 (Singer Metrics)	Provides comparison standard for ratio test	1.111111 to -0.111111 ratios	Per National Bureau of Standards Calibration Test
Bridge Transformer	Model ST248 (Singer Metrics)	Provides signal isolation	120 vac, 400 HZ (maximum)	
Null Indicator	Model NI-3 (Singer Metrics)	Provides means of comparing output voltage		
Decade Resistance Box		Provides voltage divider network	1 megohm range	±0.5%
Vacuum Tube Voltmeter	Model 410B (Hewlett-Packard)	Measuring voltages		±5%
Switch		Check voltage divider network	SPDT	

SECTION VII
PARTS LIST

ITEM		PART NO.	MANUFACTURER
1	Connector, J1	MRE-34P-J6	Winchester
2	Connector, J2	MRE-34S-J6	Winchester
3	Fuse, 1.5 amp, F1 and F2	MDL 1-1/2	Littelfuse
4	Fuseblock	3795	Bussman
5	Terminal Board Assembly (TB1 through TB6, Decade Units)	AA-1310-*	Singer
5.1	Diode (CR1 through CR8)	1N4148	
5.2	Relay (K1 and K2)	R10-E1-Z4	Parelco
5.3	Relay (K3 and K4)	R10-E1-Z6	Parleco
6	Terminal Board Assembly (TB1 through TB6, Octal Units)	AA-1310-*	Singer
6.1	Diode (CR1 through CR7)	1N4148	
6.2	Relay (K1 and K2)	R10-E1-Z4	Parelco
6.3	Relay (K3)	R10-E1-Z6	Parelco
7	Terminal Board Assembly (TB7)	AA-1309-*	Singer
7.1	Diode (CR1 through CR5)	1N4148	
7.2	Relay (K1)	R10-E1-Z4	Parelco
7.3	Relay (K2 and K3)	R10-E1-Z2	Parelco
8	Transformer Assembly (PRT-0-30020)	1-002439-001	Singer
	Transformer Assembly (PRT-D-50022)	1-002440-001	Singer

*Basic part number, dash numbers vary with D.C. voltage polarity latching, and special features requirements.

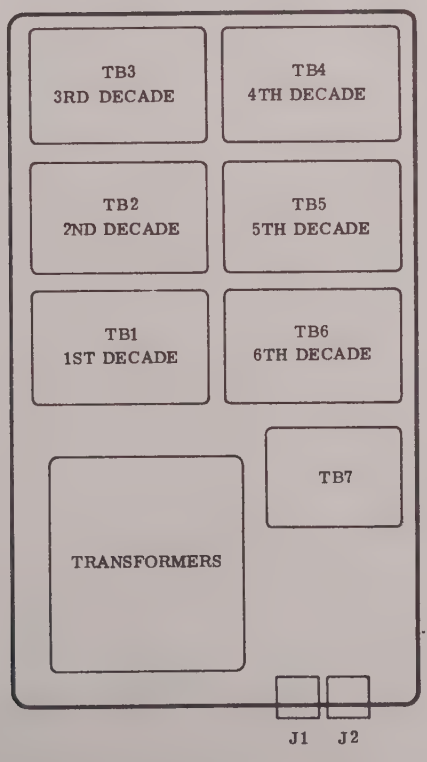


Figure 7-1. Layout of Parts

DIFFERENCE DATA SHEET

PROGRAMMABLE RATIO TRANSFORMER

MODEL PRT-2684

Programmable Ratio Transformer Model PRT-2684 is identical to Model PRT-D-60342 with the exception of the differences noted below. Full information on Model PRT-D-60342 is given in the Programmable Ratio Transformer Manual (#1-500783-007). See Table 1-2 in this manual for complete description.

DIFFERENCES

Model PRT-2684 has three panel connectors instead of two.

J1 Programming Connector

J2 Signal Connector

J3 Power Connector

Other Reference Documents

1. See drawing #1-501078-001 for connector pin functions.
2. See drawing #3-501077-001 for schematic diagram.

REVISED

APPROVED

SINGER ELECTRONIC PRODUCTS DIVISION GERTSCH OPERATION LOS ANGELES, CALIF.	TITLE Difference Data Sheet Programmable Ratio Transformer Model PRT-2684	DWG NO. I- 410190 SHEET 1 OF 1

FORM NO. 160-1M-3-70-P-H

PROBRAMMABLE RATIO TRANSFORMER EXTERNAL CONNECTIONS:

(A) J1 PROGRAMMING CONNECTOR
MRE-34P-J6

PIN	FUNCTION
A	0.8
B	0.4
C	0.2
D	0.1
E	0.08
F	0.04
H	0.02
J	0.01
K	0.008
L	0.004
M	0.002
N	0.001
P	0.0008
R	0.0004
S	0.0002
T	0.0001
U	0.00008
V	0.00004
W	0.00002
X	0.00001
Y	0.000008
Z	0.000004
AA	0.000002
BB	0.000001
CC	PHASE 1 = 180° 0 = 0°
DD	VOLTAGE 1 = 115:28 0 = 1:1
EE	NO CONNECTION
FF	+28 VDC RETURN
HH	NO CONNECTION
JJ	NO CONNECTION
KK	NO CONNECTION
LL	NO CONNECTION
MM	CASE GROUND
NN	+28 VDC (RELAY COMMON)

REVISED

APPROVED

SINGER ELECTRONIC PRODUCTS DIVISION GERTSCH OPERATION LOS ANGELES, CALIF.	TITLE PIN FUNCTION MODEL PRT-2684	DWG NO. I-501078-001 SHEET 1 OF 2

FORM NO. 160 1M 3-70 D-H

PROGRAMMABLE RATIO TRANSFORMER EXTERNAL CONNECTIONS: (CONTINUED)

(B) J2 SIGNAL CONNECTOR
MRE -7P-J6

PIN	FUNCTION
A	INPUT HIGH
B	INPUT LOW
C	OUTPUT HIGH
D	OUTPUT LOW
E	CASE GROUND

(C) J3 POWER CONNECTOR
MS3102A10SL-3P

PIN	FUNCTION
A	+28VDC (RELAY COMMON)
B	+28 VDC RETURN
C	CASE GROUND

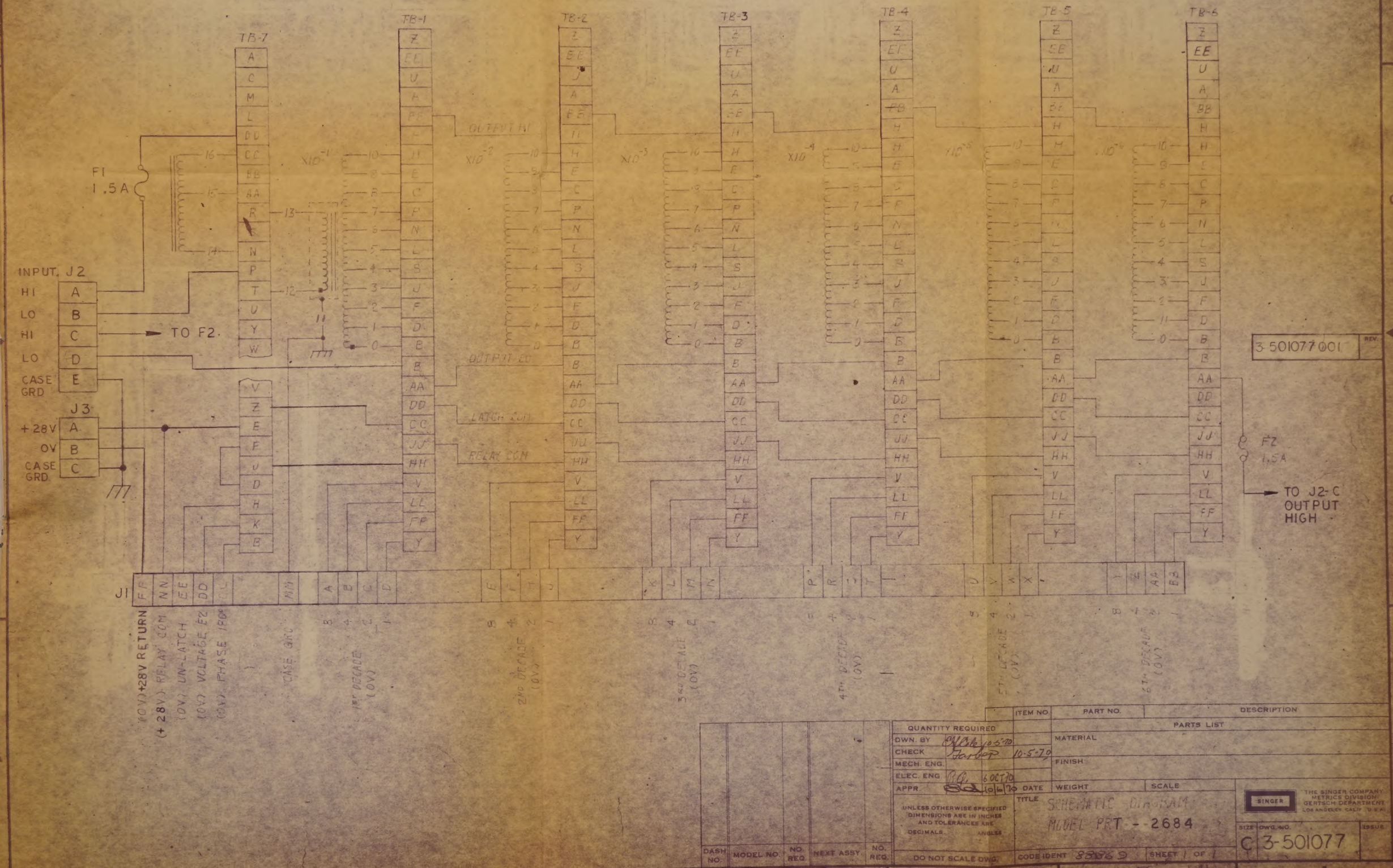
REVISED

APPROVED

SINGER ELECTRONIC PRODUCTS DIVISION GERTSCH OPERATION LOS ANGELES, CALIF.	TITLE PIN FUNCTION MODEL PRT-2684	DWG NO. I-501078-001 SHEET 2 OF 2

FORM NO. 160 1M-3-70 D-H

ISSUE	PCN. NO.	CHANGE	DATE	CHK.



3-501077001 REV.

ITEM NO.	PART NO.	DESCRIPTION
		PARTS LIST

QUANTITY REQUIRED		MATERIAL	
DWN. BY	CW Oakey 10-5-70	FINISH	
CHECK	Barbee 10-5-70		
MECH. ENG.			
ELEC. ENG	RG 6 OCT 70		
APPR	BG 10/6/70 DATE	WEIGHT	SCALE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND TOLERANCES ARE DECIMALS ANGLES

TITLE: SCHEMATIC DIAGRAM
MODEL PRT--2684

DO NOT SCALE DWG. CODE IDENT 85569 SHEET 1 OF 1

DASH NO.	MODEL NO.	NO. REQ.	NEXT ASSY.	NO. REQ.

THE SINGER COMPANY
METRICS DIVISION
GENTSCH DEPARTMENT
LOS ANGELES, CALIF. U.S.A.

SIZE C | DWG. NO. 3-501077 | ISSUE